

CLAIMS

1. A chest wall oscillator comprising
a chest band for placement around a chest of a person,
a drive carried by the chest band and operable to vary the
circumference of the chest band to apply oscillating compressive force on the chest of
the person at an oscillation frequency higher than a breathing frequency of the person,
and
compensation means coupled to the chest band for permitting the chest
band circumference to expand and contract at the person's breathing frequency as the
person breathes and for maintaining the oscillating compressive force on the chest of
the person regardless of the amount of expansion and contraction of the chest band at
the person's breathing frequency.
2. The chest wall oscillator of claim 1, wherein the compensation
means comprises a viscous coupling.
3. The chest wall oscillator of claim 2, wherein the drive
comprises a motor and a linkage, the viscous coupling includes a first element
coupled to the linkage, and the viscous coupling includes a second element coupled to
the chest band.
4. The chest wall oscillator of claim 3, wherein the first element
comprises a piston and the second element comprises a cylinder.
5. The chest wall oscillator of claim 3, wherein the viscous
coupling comprises a spring biasing the first element relative to the second element to
tension the chest band.
6. The chest wall oscillator of claim 2, wherein the viscous
coupling comprises a cylinder and a piston in the cylinder, the piston having an
opening therethrough, and the cylinder containing a fluid that flows through the
opening from one side of piston to another as the piston moves within the cylinder.
7. The chest wall oscillator of claim 1, wherein the chest band
comprises an air bladder and the compensation means comprises a blower and a

restriction situated between the blower and the air bladder, the blower being in pneumatic communication with the air bladder through the restriction.

8. The chest wall oscillator of claim 7, wherein during exhalation of the person, the person's chest contracts and air flows from the blower, through the restriction, and into the air bladder; and during inhalation of the person, the person's chest expands and air flows from the air bladder, through the restriction, and backwards through the blower.

9. The chest wall oscillator of claim 7, wherein the restriction is sized to provide a high-pass filter effect so that rapid air flows caused by the oscillating compressive force at the oscillation frequency are substantially blocked from passing through the restriction and so that slow air flows at the person's breathing frequency are substantially passed through the restriction.

10. The chest wall oscillator of claim 1, wherein the chest band comprises an air bladder containing air; the compensation means comprises a pressure transducer to sense the pressure within the air bladder, a low pass filter that receives a pressure signal from the pressure transducer, and an amplifier that compares an output of the low pass filter with a reference voltage; and an output signal from the amplifier is coupled to the drive to control operation of the drive.

11. The chest wall oscillator of claim 1, wherein the drive comprises a motor and a linkage; the compensation means comprises a sensor coupled to the chest band and the linkage, a low pass filter that receives a sensor signal from the sensor indicative of a tension force associated with the chest band, and an amplifier that compares an output from the low pass filter with a reference voltage; and an output signal from the amplifier is coupled to the drive to control the operation of the motor.

12. The chest wall oscillator of claim 1, wherein the compensation means comprises a foam piece coupled to the chest band and the foam piece has pores sized such that the foam piece passes the oscillating compressive force to the person's chest at the oscillation frequency and absorbs the expansion and contraction of the patient's chest at the person's breathing frequency.

13. The chest wall oscillator of claim 1, wherein the compensation means comprises a feedback system to sense a breathing force and to adjust the drive to compensate for the breathing force.

14. The chest wall oscillator of claim 13, wherein the feedback system comprises a low pass filter.

15. The chest wall oscillator of claim 1, wherein the oscillation frequency is sufficient to promote airway clearance of mucus from the person's lungs.

16. The chest wall oscillator of claim 15, wherein the drive is adjustable so that the oscillation frequency is a selected frequency in the range of about 5 Hz to about 20 Hz.

17. The chest wall oscillator of claim 1, further comprising a user control carried by the chest band and accessible to the person to allow the person to select the oscillation frequency at which the drive operates.

18. A chest wall oscillator comprising
a chest band for placement around a chest of a person,
a drive unit carried by the chest band, the drive unit having a motor and a linkage coupled to the motor and coupled to the chest band, the motor being operable to move the linkage to vary the circumference of the chest band to apply oscillating compressive force on the chest of the person at an oscillation frequency higher than a breathing frequency of the person, the drive unit further having a user control that is accessible to the person to adjust the oscillation frequency.

19. The chest wall oscillator of claim 18, further comprising compensation means coupled to the chest band for permitting the chest band circumference to expand and contract at the person's breathing frequency and for maintaining the oscillating compressive force on the chest of the person regardless of the amount of expansion and contraction of the chest band at the person's breathing frequency.

20. A chest wall oscillator comprising
a chest band for placement around a chest of a person,
a drive carried by the chest band and operable to vary the circumference of the chest band to apply oscillating compressive force on the chest of the person at an oscillation frequency, and

means for allowing the chest band to expand and contract at the person's breathing frequency as the person breathes, the oscillation frequency being in the range of about 20 times to about 40 times faster than the breathing frequency.